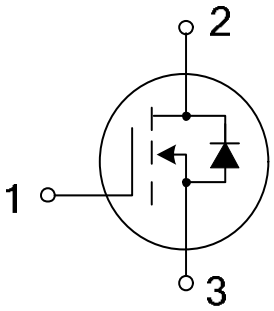
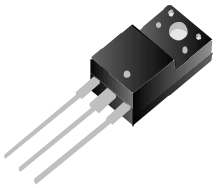
Features

- 650V,12A
  $R_{DS(ON)}$ <800mΩ @V_{GS}=10V TYP:605mΩ
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability





TO-220F

Applications

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)
- LED lighting power

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity (PCS)
12N65F	AP12N65F	TO-220F	-	-	1000

ABSOLUTE MAXIMUM RATINGS (T_J=25℃ unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	650	V
Gate-Source Voltage	V_{GS}	±30	V
Continuous Drain Current (T_a =25℃)	I_D	12	A
Avalanche Current(1)	I_{AS}	48	A
Pulsed Drain Current (1)	I_{DM}	48	A
Single Pulsed Avalanche Energy (2)	E_{AS}	311	mJ
Power Dissipation	P_D	53	W
Thermal Resistance from Junction to Case	$R_{\theta JC}$	2.44	℃/W
Thermal Resistance from Junction to Ambient	$R_{\theta JA}$	62.5	℃/W
Junction Temperature	T_J	150	℃
Storage Temperature	T_{STG}	-55~ +150	℃

MOSFET ELECTRICAL CHARACTERISTICS(T_J=25℃ unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Type	Max	Unit
Static Characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D =250μA	650	-	-	V
Zero gate voltage drain current	I_{DSS}	V_{DS} =650V, V_{GS} = 0V,T_J=25℃	-	-	1	μA
Gate-body leakage current	I_{GSS}	V_{GS} =±30V, V_{DS} = 0V	-	-	±100	nA
Gate threshold voltage	$V_{GS(th)}$	V_{DS} =V_{GS}, I_D =250μA	2.0	3.0	4.0	V
Drain-source on-resistance(3)	$R_{DS(on)}$	V_{GS} =10V, I_D =3.0A	-	573	790	mΩ
		V_{GS} =10V, I_D =6.0A		605	800	mΩ
Dynamic characteristics						
Input Capacitance	C_{iss}	V_{DS} =25V, V_{GS} =0V, f =1.0MHz	-	2100	-	pF
Output Capacitance	C_{oss}		-	162.6	-	
Reverse Transfer Capacitance	C_{rss}		-	7.0	-	
Switching characteristics						
Turn-on delay time	$t_{d(on)}$	V_{DD}=325V, I_D=12A, R_G=25Ω	-	27.6	-	ns
Turn-on rise time	t_r		-	52.6	-	
Turn-off delay time	$t_{d(off)}$		-	75.2	-	
Turn-off fall time	t_f		-	42.5	-	
Total Gate Charge	Qg	V_{DS}=520V, I_D=12A, V_{GS}=10V	-	37	-	nC
Gate-Source Charge	Qgs		-	7.4	-	
Gate-Drain Charge	Qgd		-	18	-	
Source-Drain Diode characteristics						
Diode Forward voltage	V_{SD}	T_J=25℃, V_{GS} =0V, I_S=12A	-	-	1.4	V
Diode Forward current	I_S	T_C=25℃	-	-	12	A
Body Diode Reverse Recovery Time	trr	T_J=25℃，IF=12A,di/dt=100A/us		566		ns
Body Diode Reverse Recovery Charge	Qrr	T_J=25℃，IF=12A,di/dt=100A/us		58		uc

Notes:

1. Pluse width limited by maximum junction temperature
2. L=20mH, VDD=100V, VG=10V, RG=25Ω, starting TJ=25℃
3. Pulse Test: Pulse width ≤300μs, Duty cycle≤2%
4. Essentially independent of operating temperature

Typical Performance Characteristics

Figure 1. On-Region Characteristics

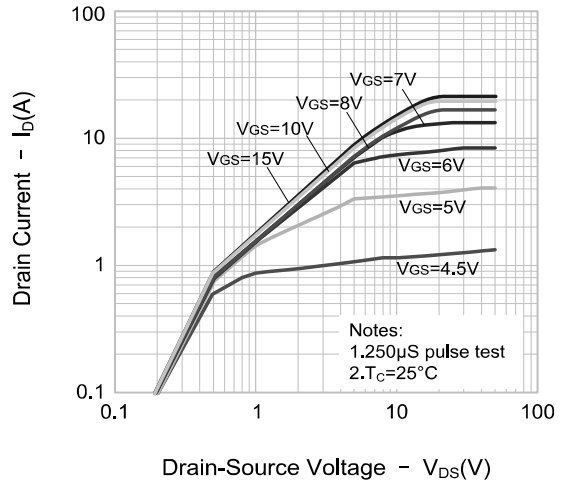


Figure 2. Transfer Characteristics

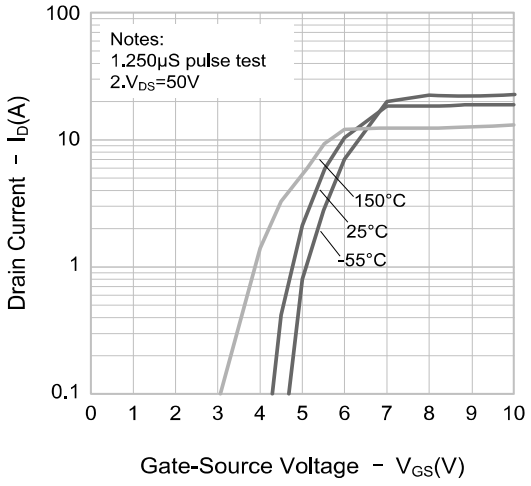


Figure 3. On-resistance vs. Drain Current

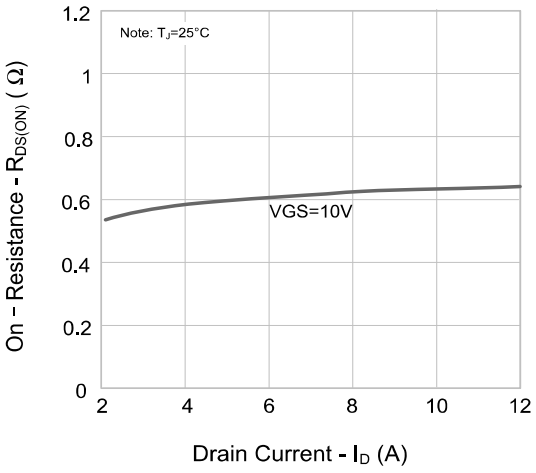


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

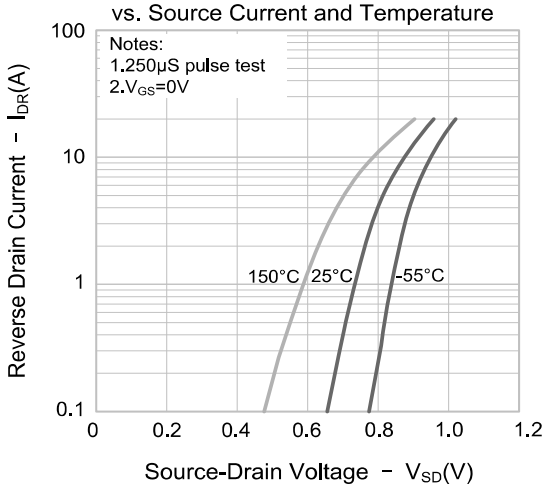


Figure 5. Capacitance Characteristics

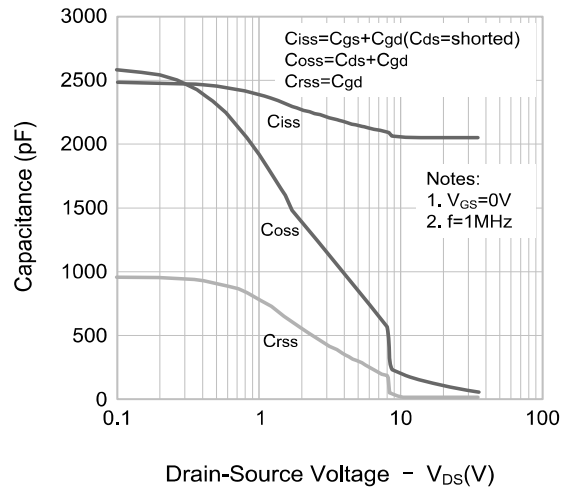
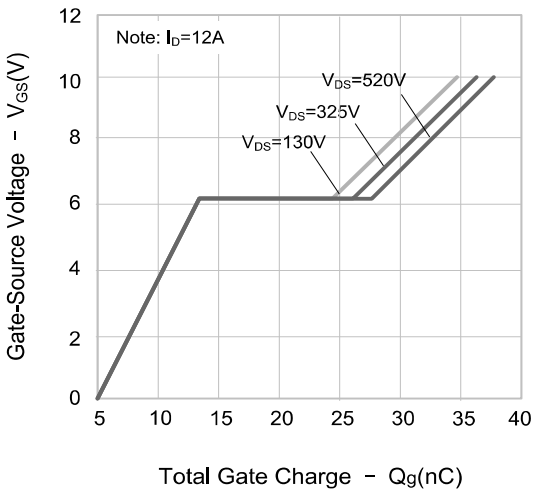


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics

Figure 7. Breakdown Voltage Variation vs. Temperature

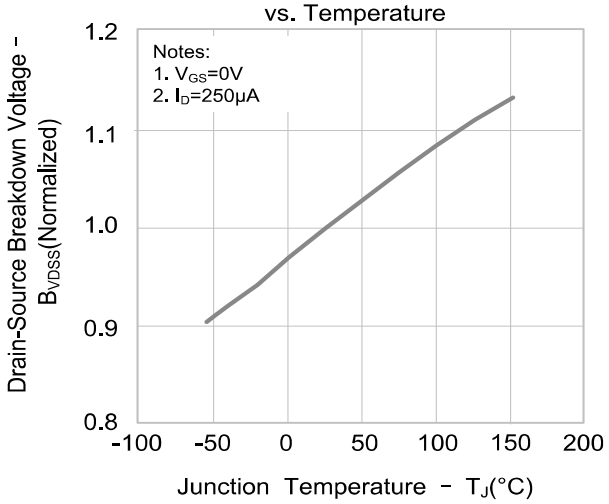


Figure 8. On-resistance vs. Temperature

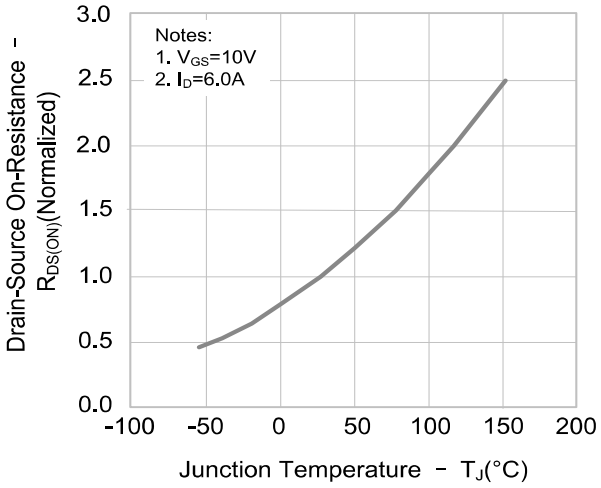
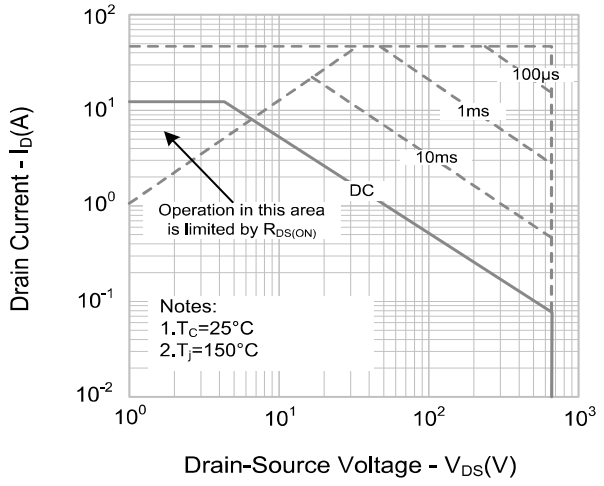
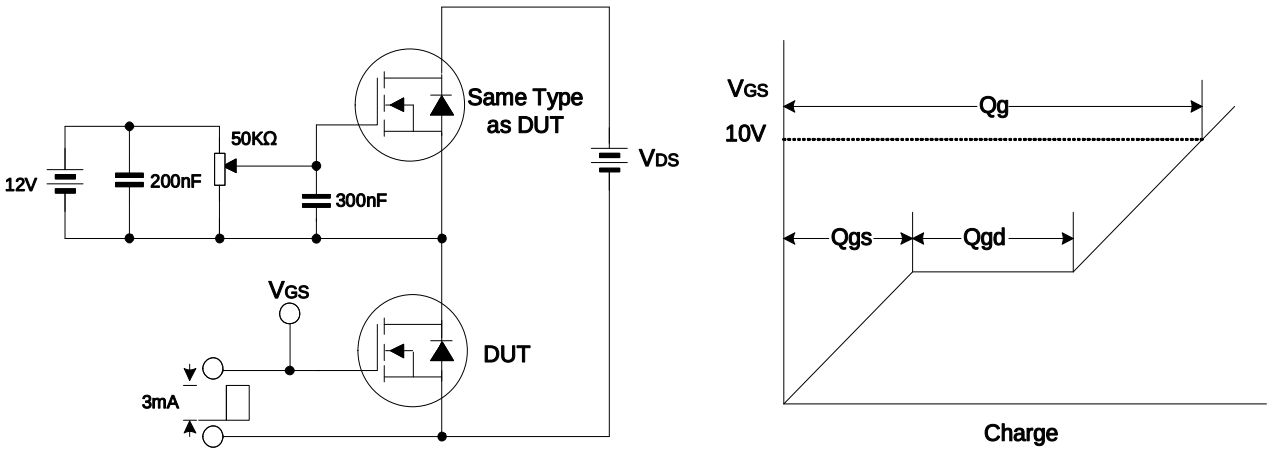


Figure 9. Max. Safe Operating Area

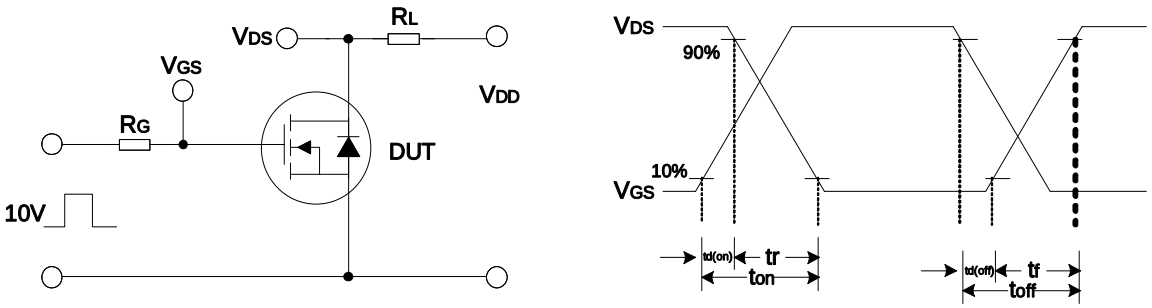


TYPICAL TEST CIRCUIT

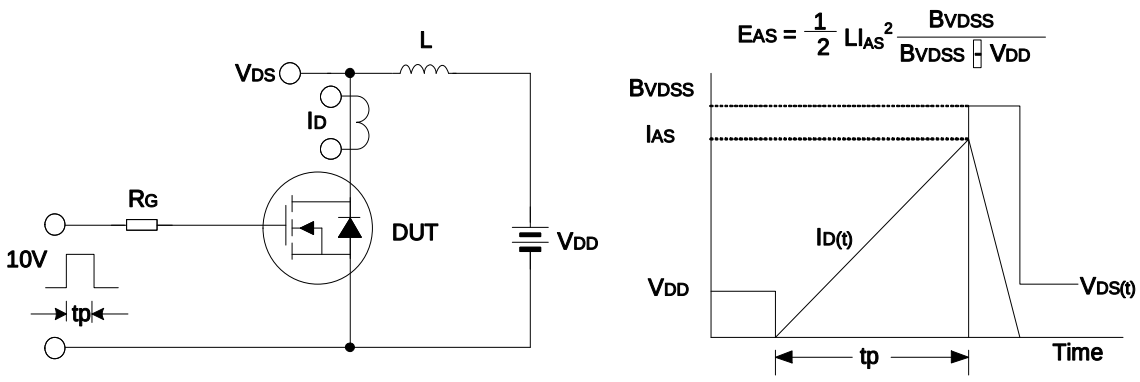
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveform



Unclamped Inductive Switching Test Circuit & Waveform



Package Dimensions of TO-220F

Note: UNIT: mm